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SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN THAT WE, Ichiro Okajima, a citizen of Japan residing at 968-12-1-302, Mutsuura-cho, Kanazawa-ku, Yokohama-shi, Kanagawa 236-0032 Japan and Narumi Umeda, a citizen of Japan residing at 968-12-2-201, Mutsuura-cho, Kanazawa-ku, Yokohama-shi, Kanagawa 236-0032 Japan have invented certain new and useful improvements in

VIRTUAL TERMINAL CONFIGURING METHOD AND DEVICE

of which the following is a specification:-

It is a general object of the present invention to overcome the above disadvantage.

A more specific object of the present invention is to provide a virtual terminal configuring method and
5 device in which a plurality of terminals are arranged so as to form a virtual terminal capable of handing various types of communications.

The above objects of the present invention are achieved by a method comprising the steps of: (a) managing
10 terminal management information concerning a plurality of communication terminals of a user; (b) identifying, when a call addressed to the above user is initiated, one or more terminals that can accept the call by referring to an ability needed for a communication involved in the call
15 and the terminal management information concerning the plurality of communication terminals managed by the step (a); and (c) separating information involved in the call into items of information to be sent to the above one or more terminals identified by the step (b) and combining
20 items of information from the above one or more terminals identified by step (b) into information to be sent to one of the plurality of communication terminals that initiates the call. A virtual terminal is formed by the above one or more terminals identified by the step (b) and
25 communicates with the above one of the plurality of communication terminals.

The above objects of the present invention are also achieved by a virtual terminal configuring device comprising: a first part managing terminal management
30 information concerning a plurality of communication terminals of a user; a second part identifying, when a call addressed to the user is initiated, one or more terminals that can accept the call by referring to an

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ability needed for a communication involved in the call and the terminal management information concerning the plurality of communication terminals managed by said first part; and a third part separating information involved in
5 the call into items of information to be sent to the above one or more terminals identified by the second part and combining items of information from the above one or more terminals identified by the second part into information to be sent to one of the plurality of communication
10 terminals that initiates the call. A virtual terminal being formed by the above one or more terminals identified by the second part and communicates with the above one of the plurality of communication terminals.

The above objects of the present invention are
15 also achieved by a device comprising: a plurality of communication terminals of users; and a virtual terminal configuring device to which the plurality of communication terminals are coupled. The virtual terminal configuring device comprises: a first part managing terminal
20 management information concerning the plurality of communication terminals; a second part identifying, when a call addressed to a first one of the users is initiated, one or more terminals of the first one of the users that can accept the call by referring to an ability needed for
25 a communication involved in the call and the terminal management information concerning the communication terminals; and a third part separating information involved in the call into items of information to be sent to the above one or more terminals identified by the
30 second part and combining items of information from the above one or more terminals identified by the second part into information to be sent to one of the communication terminals of a second one of the users that initiates the

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call. A virtual terminal is formed by the above one or more terminals identified by the second part so that the virtual terminal of the first one of the users and the above one of the communication terminals of the second user can communicate with each other.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the present invention will become more apparent from the following detailed description when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a diagram of a conventional videophone communication system;

Fig. 2 is a block diagram of a communication system including a virtual terminal configuring device according to a first embodiment of the present invention;

Fig. 3 is a block diagram of a communication system including a virtual terminal configuring device according to a second embodiment of the present invention;

Fig. 4 is a block diagram of a communication system including a virtual terminal configuring device according to a third embodiment of the present invention;

Fig. 5 is a block diagram of a communication system including a virtual terminal configuring device according to a fourth embodiment of the present invention;

Fig. 6 is a diagram of a network structure of a communication system including the virtual terminal configuring system of the present invention;

Fig. 7 is a diagram showing how a device management function unit acknowledges kinds of information handled by communication terminals;

Fig. 8 is a diagram showing how the device management function unit integrates communication

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terminals coupled to a network.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 2 is a block diagram of a communication system of a virtual terminal configuring device according to a first embodiment of the present invention.

Referring to Fig. 2, user A is allowed to use communication terminals 20_1 through 20_N , which are connected to a virtual terminal configuring device 22. The virtual terminal configuring device 22 is connected, via a network 25, to a communication terminal 26 allowed to be used by user B. The communication terminals 20_1 through 20_N are capable of inputting and outputting various kinds of information, such as voices, images, characters and numeral values. The communication terminal 26 is capable of integrally inputting and outputting the various kinds of information as those handled by the communication terminals 20_1 through 20_N .

The virtual terminal configuring device 22 is primarily made up of a virtual terminal function unit 23 and a device management function unit 24. The virtual terminal function 23 has communication protocol units 27_1 through 27_N , to which the communication terminals 20_1 through 20_N are connected, respectively. Thus, two-way communications can take place between the communication terminals 20_1 through 20_N and the communication protocol units 27_1 through 27_N , respectively. The communication terminal 26 is connected, via the network 25, to a communication protocol unit 34 provided in the virtual terminal function unit 23. The communication protocol unit 34 has a communication protocol of the communication terminal 26, and communicates therewith in two ways.

The communication protocol units 27_1 through 27_N

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are respectively connected to information coding scheme converting units 28_1 through 28_N , which respectively implement the mutual conversions between the information coding scheme of the communication protocol unit 34 and the information coding schemes of the communication protocol units 27_1 through 27_N . For example, in a virtual terminal communication, if the communication protocol unit 34 employs MPEG1 as an information coding scheme for moving pictures and one of the communication protocol units 27_1 through 27_N , for example, the communication protocol unit 27_1 employs MPEG4 as an information coding scheme for moving pictures, the information coding scheme converting unit 28_1 performs the mutual conversion between MPEG1 and MPEG4. When the information coding scheme includes information produced by data compression, the information coding scheme converting unit performs associated data decompression and data compression at the time of converting the information coding scheme. That is, data decompression and data compression are part of the work along with the conversion of the information coding scheme.

The information coding scheme converting units 28_1 through 28_N have a filtering function. The filtering function is used in case where there is a large difference between the bit rate of channels of the network 25 to which the communication protocol unit 34 is connected and the bit rate of channels of a network to which the communication protocol units 27_1 through 27_N are connected. In the above case, the filtering function extracts information assigned comparatively high priority from the entire information. With the filtering function, it is possible to reduce the amount of information handled by an information coding scheme used in a comparatively high bit

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rate to the amount of information handled by another information coding scheme used in a comparatively low bit rate.

5 The items of information respectively output by the information coding scheme converting units 28_1 through 28_N are supplied to an information combining unit 30. Then, the information combining unit 30 combines the items of information which are supplied from the information coding scheme converting units 28_1 through 28_N and are
10 processed by the same information coding scheme. The combined or multiplexed information thus obtained is supplied to the communication protocol unit 34, which sends the synthesized information from the information combining unit 30 to the communication terminal 26.

15 The communication protocol 34 supplies information received from the communication terminal 26 to an information separating unit 32. The information separating unit 32 separates the multiplexed information into the respective kinds of information such as voices,
20 images, characters and numeral values. The kinds of information are supplied to the corresponding information coding scheme converting units 28_1 through 28_N . Then, the converting units 28_1 through 28_N convert the information of the information coding scheme employed in the
25 communication protocol unit 34 into the respective information coding schemes of the communication protocol units 27_1 through 27_N , and supply the items of the converted information thereto.

30 The device management function unit 24 of the virtual terminal configuring device 22 includes a terminal management unit 36. The terminal management unit 36 is informed, by the communication protocol units 27_1 through 27_N and 34 of the virtual terminal function unit 23, of a

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variety of management information on the communication terminals 20_1 through 20_N , such as the kinds of information handled thereby, functions, human interface abilities, communication abilities and communication status

5 (indicating whether a requested communication should be allowed) of the communication terminals 20_1 through 20_N . Then, in accordance with the kinds of information that are input to and output from the communication terminals 20_1 through 20_N , the terminal management unit 36 supplies
10 control signals to the communication protocol units 27_1 through 27_N and 34, the information coding scheme converting units 28_1 through 28_N , the information combining unit 30 and the information separating unit 32 in order to control the operations thereof.

15 When the communication terminal 26 of user B initiates a call addressed to any of the communication terminals 20_1 through 20_N of user A, the device management function unit 24 checks the abilities of communication terminals of user A which are available for communications
20 at that time by referring to the human interface and communication abilities needed by the communication terminal 26. Then, the device management function unit 24 identifies communication terminals which can accept the call made by the communication terminal 26. The selected
25 communication terminal among the communication terminals 20_1 through 20_N of user A is virtually integrated into a single communication terminal (virtual terminal) by the virtual terminal function unit 23. Thus, a communication can take place between the virtual terminal thus
30 constructed and the communication terminal 26 of user B.

Fig. 3 is a block diagram of a communication system of a virtual terminal configuring device according to a second embodiment of the present invention.

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Referring to Fig. 3, a cellular phone 40 and a PDA 41 that can be used by user A are connected to a virtual terminal configuring device 42. The virtual terminal configuring device 42 is connected, via a network 5 45, to a videophone communication terminal 46 that can be used by user B.

The virtual terminal configuring device 42 is primarily made up of a virtual terminal function unit 43 and a device management function unit 44. The cellular 10 phone 40 and the PDA 41 are respectively connected to communication protocol units 47_1 and 47_2 in the virtual terminal function unit 43. Thus, two-way communications can take place between the cellular phone 40 and the communication protocol unit 47_1 and between the PDA 41 and 15 the communication protocol unit 47_2 . The videophone communication terminal 46 is connected, via the network 45, to a communication protocol unit 54 provided in the virtual terminal function unit 43. The videophone communication terminal 46 and the communication protocol 20 unit 54 communicate with each other in two ways.

The communication protocol units 47_1 and 47_2 are respectively connected to the information coding scheme converting units 48_1 and 48_2 . The information coding scheme converting unit 48_1 converts voice information of 25 the information coding scheme employed in the cellular phone supplied by the communication protocol unit 47_1 into voice information of the information coding scheme employed in the videophone. The converted voice information thus obtained is supplied to an information 30 combining unit 50. The information coding scheme converting unit 48_2 converts video information of the information coding scheme for the PDA supplied by the communication protocol unit 47_2 into video information of

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the information coding scheme for the videophone. The converted video information thus obtained is supplied to the information combining unit 50. For example, when information supplied from the PDA 41 forms a still picture, it is converted into video information describing animation by the information coding scheme converting unit 48₂. The information coding scheme converting units 48₁ and 48₂ are respectively equipped with the filtering functions.

10 The information combining unit 50 combines the voice and video information of the information coding scheme for the videophone respectively supplied from the information coding scheme converting units 48₁ and 48₂ into integrated videophone information conforming to the videophone. The integrated videophone information is then sent to the communication protocol unit 54, which sends the received videophone information to the videophone communication terminal 46 via the network 45.

20 The communication protocol unit 54 supplies videophone information received from the videophone communication terminal 46 to an information separating unit 52. Then, the information separating unit 52 separates the received videophone information into voice information and video information, which are respectively supplied to the information coding scheme converting units 48₁ and 48₂. Then, the unit 48₁ converts the voice information conforming to the videophone into voice information conforming to the cellular phone. The voice information thus converted is then supplied to the communication protocol unit 47₁. Similarly, the unit 48₂ converts the video information conforming to the videophone into video information conforming to the cellular phone. The video information thus converted is

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then supplied to the communication protocol unit 47₂.

The device management function unit 42 of the virtual terminal configuring device 42 includes a terminal management unit 56. The terminal management unit 56 is
5 informed, by the communication protocol units 47₁ 47₂ and 54 of the virtual terminal function unit 43, of a variety of management information on the cellular phone 40, the PDA 41 and the videophone communication terminal 46, such as the kinds of information handled thereby, functions,
10 human interface abilities, communication abilities and communication status of the cellular phone 40, the PDA 41 and the videophone communication terminal 46. Then, in accordance with the kinds of information that are input to and output from the cellular phone 40, the PDA 41 and the
15 videophone communication terminal 46, the terminal management unit 56 supplies control signals to the communication protocol units 47₁, 47₂ and 54, the information coding scheme converting units 48₁ and 48₂, the information combining unit 50 and the information
20 separating unit 52 in order to control the operations thereof.

When the videophone communication terminal 46 of user B makes a call addressed to either the cellular phone 40 or the PDA 41 of user A, the device management function
25 unit 44 checks the abilities of communication terminals of user A which are available for communications at that time by referring to the human interface and communication abilities needed by the videophone communication terminal 46. Then, the device management unit 44 identifies the
30 cellular phone 40 or the PDA 41 which can accept the call made by the videophone communication terminal 46. The selected terminal of user A is virtually integrated into a single communication terminal (virtual terminal) by the

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virtual terminal function unit 43. Thus, a communication can take place between the virtual terminal and the videophone communication terminal 46 of user B.

Fig. 4 is a block diagram of a communication system of a virtual terminal configuring device according to a third embodiment of the present invention. Any part shown in Fig. 2 that is the same as a part shown in Fig. 4 is denoted by the same reference numeral in both figures. A virtual terminal configuring device 37 is substituted for the communication terminal 26 and is connected to the network 25. The virtual terminal configuring device 37 has the same configuration and operation as those of the virtual terminal configuring device 22. Communication terminals 38_1 through 38_M that can be used by user B are connected to the virtual terminal configuring device 37.

With the above configuration, the communication terminals 20_1 through 20_N that can be used by user A are virtually integrated into a single communication terminal (virtual terminal) by means of the virtual terminal configuring device 22, and the communication terminals 38_1 through 38_M that can be used by user B are virtually integrated into a single communication terminal (virtual terminal) by means of the virtual terminal configuring device 37. Thus, a communication can take place between the virtual terminal devices of users A and B.

Fig. 5 is a block diagram of a communication system of a virtual terminal configuring device according to a fourth embodiment of the present invention. Communication terminals 60_1 through 60_N that can be used by user A are connected to a virtual terminal configuring device 62, which is connected, via the network 25, to communication terminals 66_1 through 66_M that can be used by user B. The communications terminals 60_1 through 60_N and

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66₁ through 66_M are capable of inputting and outputting various kinds of information such as voices, images, characters and numeral values.

The virtual terminal configuring device 62 is primarily made up of a virtual terminal function unit 63 and a device management function unit 64. The communication terminals 60₁ through 60_N are respectively connected to associated communication protocol units 67₁ through 67_N provided in the virtual terminal function unit 63. Thus, two-way communications take place between the communication terminals 60₁ through 60_N and the communication protocol units 67₁ through 67_N, respectively. The communication terminals 66₁ through 66_M are connected to associated communication protocol units 76₁ through 76_M provided in the virtual terminal function unit 63. Thus, two-way communications can take place between the communication terminals 66₁ through 66_M and the communication protocol units 76₁ through 76_M.

The communication protocol units 67₁ through 67_N are connected to information coding scheme converting units 68₁ through 68_N. The units 68₁ through 68_N convert the items of information that are supplied from the communication protocol units 67₁ through 67_N and conform to the respective information coding schemes into information of a common information coding scheme. Then, the information of the common information coding scheme is supplied to an information combining unit 70. Each of the information coding scheme converting units 68₁ through 68_N has the aforementioned filtering function.

The information combining unit 70 combines the items of information of the common coding scheme respectively supplied from the information coding scheme converting units 68₁ through 68_N, and thus produces

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combined or multiplexed information, which is then
supplied to an information separating unit 71. The
information separating unit 71 separates the multiplexed
information into the respective kinds of information such
5 as voices, images, characters and numeral values. The
respective kinds of information thus obtained are supplied
to the corresponding information coding scheme converting
units 74₁ through 74_N. Then, the converting units 74₁
through 74_N convert the information of the common
10 information coding scheme into the respective information
coding schemes of the communication protocol units 76₁
through 76_N, and supply the items of the converted
information thereto. Each of the information coding
scheme converting units 74₁ through 74_M has the
15 aforementioned filtering function. The communication
protocol units 76₁ through 76_M send the respective kinds of
information thus obtained to the corresponding
communication terminals 66₁ through 66_M.

The communication protocol units 76₁ through 76_M
20 supply various kinds of information such as voices, images,
characters and numeral values received from the
communication terminals 66₁ through 66_M to the information
coding scheme converting units 74₁ through 74_N,
respectively. The corresponding information coding scheme
25 converting units 74₁ through 74_N convert the items of
information of the respective information coding schemes
into information of the common information coding scheme.
The information thus obtained is then supplied to an
information combining unit 73.

30 The information combining unit 73 combines the
items of the information data of the common information
coding scheme respectively supplied from the information
coding scheme converting units 74₁ through 74_M, and

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supplies the combined or multiplexed data to an information separating unit 72. The information separating unit 72 separates the multiplexed information into the respective kinds of information such as voices, images, characters and numeral values. Then, the respective kinds of information are supplied to the corresponding information coding scheme converting units 68₁ through 68_N. The units 68₁ through 68_N convert the information of the common information coding scheme supplied from the information separating unit 72 into the items of information of the respective information coding schemes of the communication protocol units 67₁ through 67_N. The items of information thus converted are then supplied to the communication protocol units 76₁ through 76_N, which send the corresponding items of information to the communication terminals 60₁ through 60_N.

The device management function unit 64 of the virtual terminal configuring device 62 includes a terminal management unit 78. The terminal management unit 78 is informed, by the communication protocol units 67₁ through 67_N and 76₁ through 76_M a of the virtual terminal function unit 63, of a variety of management information on the communication terminals 60₁ through 60_N and 66₁ through 66_M, such as the kinds of information handled thereby, functions, human interface abilities, communication abilities and communication status of the communication terminals 60₁ through 60_N and 66₁ through 66_M. Then, in accordance with the kinds of information that are input to and output from the communication terminals 60₁ through 60_N and 66₁ through 66_M, the terminal management unit 78 supplies control signals to the communication protocol units 67₁ through 67_N, 76₁ through 76_M, the information coding scheme converting units 68₁ through 68_N and 74₁

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through 74_M, the information combining units 70 and 73, and the information separating units 71 and 72 in order to control the operations thereof.

Thus, the communication terminals 20₁ through 20_N that can be used by user A are virtually integrated into a single communication terminal (virtual terminal) by means of the virtual terminal configuring device 62, and similarly the communication terminals 66₁ through 66_M that can be used by user B. With the virtual terminal configuring device 62, the virtual terminals of users A and B can communicate with each other.

In the above-mentioned embodiments of the present invention, the virtual terminal configuring device which virtually integrates the communication terminals is installed on the user side and is connected to the network. However, the present invention is not limited to the above formation.

The virtual terminal configuring devices 22, 42 and 62 can be implemented by the function of software. Similarly, the virtual terminal function units 23, 43 and 63 can be implemented by the function of software, and the device management function units 24, 44 and 64 can be implemented by the function of software. The virtual terminal function units 23, 43 and 63 may be provided as devices separate from (for example, remote from) the device management function units 24, 44 and 64.

A description will be given of other embodiments of the present invention.

Fig. 6 is a diagram of a network structure of a communication system using the virtual terminal configuring device according to any of the first through fourth embodiments of the present invention. Referring to Fig. 6, communication terminals 80₁ through 80₃ are

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connected to a wire IP network 81. A communication terminal 80₄ is connected to an IMT-2000 (which is the next generation mobile communications system). A communication terminal 80₅ is connected to a wireless LAN 83. Communication terminals 80₆ and 80₇ are connected to a fourth-generation mobile communication system 84.

A virtual terminal function device(VTF) 86 and a device management function device (DMF) 88, which form a virtual terminal configuring device, are connected to the fourth-generation mobile communication system 84, and are thus connected mutually. Communication terminals 80₈ and 80₉ are connected to the virtual terminal function device 86 by Bruetooth (a radio communication interface).

The virtual terminal function device 86 corresponds to one of the aforementioned virtual terminal function units 23, 43 and 63 respectively shown in Figs. 2, 4 and 5. The device management function device 88 corresponds to one of the aforementioned device management units 24, 44 and 64 respectively shown in Figs. 2, 4 and 5.

Each of the networks 25, 45 and 65 shown in Figs. 2 through 5 correspond to the whole network shown in Fig. 6. The virtual terminal function unit 23 and the device management unit 24 shown in Figs. 2 and 4 can be installed in any position in the whole network. Similarly, the virtual terminal function unit 43 and the device management unit 44 shown in Fig. 3 can be installed in any position in the whole network, and the virtual terminal function unit 63 and the device management unit 64 shown in Fig. 5 can be installed in any position in the whole network. In the network shown in Fig. 6, the virtual terminal function management device 86 and the device management function device 88 are connected to the fourth-generation mobile communication network, as has been

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described previously.

In Fig. 6, the virtual terminal function device 86 and the device management function device 88 are installed separate from each other. Alternatively, the
5 device management function device 88 can be incorporated with the virtual terminal function device 86 so that these devices are installed in the same position in the network.

The virtual terminal function device 86 and the device management function device 88 can be implemented by
10 the function of software.

As shown in Fig. 7, the device management function device 88 communicates with the communication terminals 80₁ through 80₉, and thus acknowledges management information on the communication terminals 80₁ through 80₉,
15 such as the kinds of information handled thereby, functions, human interface abilities, communication abilities and communication status of the communication terminals 80₁ through 80₉. Alternatively, the device management function device 88 may access the communication
20 terminals 80₁ through 80_N and collect a variety of management information on the communication terminals 80₁ through 80₉, such as the kinds of information handled thereby as well as functions, human interface abilities, communication abilities and communication status of the
25 communication terminals 80₁ through 80₉.

The virtual terminal function device 86 acquires a control signal from the device management function device 88 via the fourth-generation mobile communication network 84. Thus, as shown in Fig. 8, the communication
30 terminals 80₁, 80₄, 80₅, 80₈ and 80₉, that can be used by user A are virtually integrated into a single communication terminal (virtualterminal), and can communicate with the communication terminal 80₃ that can

be used by user B.

Each of the above-mentioned communication terminals has any of an audio input function, an image input function, a character input function, a numeral value input function such as a sensor, an acoustic output function, an image output function, a character output function, a memory function, an information converting function such as speech codec. For example, the communication terminal 80₃ of user B shown in Fig. 8 is a videophone communication terminal, and the communication terminal 80₁ of user A is a video camera installed at a street corner. The communication terminal 80₄ is a cellular phone, and the communication terminal 80₅ is a large-size display. The communication terminal 80₈ is a PDA, and the communication terminal 80₉ is a hard disk drive.

In light of the relationship between the relative positions of the virtual terminal function device 86 and the device management function device 88 is considered, when the virtual terminal function device 86 and the device management function device 88 are arranged in a server, communications therebetween are implemented by the function of software. When the virtual terminal function device 86 and the device management function device 88 are arranged in different servers, communications therebetween take place via one or a plurality of networks linked together.

In light of the relationship between the absolute positions of the virtual terminal function device 86 and the device management function device 88, it is possible to employ the following two arrangements. In the first arrangement, the virtual terminal function device 86 and the device management function device 88 are installed

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in a terminal that is not owned by any user. In the second arrangement, the virtual terminal function device 86 and the device management function device 88 are installed in a terminal owned by a user. In the first
5 arrangement, the virtual terminal function device 86 and the device management function device 88 are installed in a server connected to a plurality of kinds of networks in which a terminal used as a virtual terminal exists. In the second arrangement, the virtual terminal function
10 device 86 and the device management function device 88 are installed in a terminal that can be connected to a plurality of kinds of networks. The present invention is not limited to the specifically disclosed embodiments, and variations and modifications may be made
15 without departing from the scope of the present invention.

The present application is based on Japanese priority application no. 11-375794 filed on December 28, 1999, the entire contents of which are hereby incorporated by reference.